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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALANKO, ANITA KAREN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 05/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/601,148

Applicant(s)

DONALDSON ET AL.

Examiner

Anita K. Alanko

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/23/06 amdt.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 8, 12, 20 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-11, 13-19 and 21-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 21-22 and 24-26 rejected under 35 U.S.C. 102(b) as being anticipated by

Silverbrook (US 6,019,457).

Silverbrook discloses a printhead forming method comprising:

forming a fluid-handling slot (Fig.6-9) extending between a thin-film surface of a substrate (“FRONT”) and a generally opposing backside surface of the substrate (“BACK”);
the slot extending along a long axis that lies generally parallel to the thin-film surface,
wherein the slot has a cross-section taken transverse the long axis that is defined, at least in part, by one sidewall,

wherein at least a first portion of the sidewall is generally parallel to the thin-film surface of the substrate (the connection between 113 and 114), and

wherein a second portion of the one sidewall is generally perpendicular to the thin-film surface (the sidewall of 113), and

wherein a third portion of the sidewall extends from the second portion to the thin-film surface of the substrate and defines an obtuse angle with the second portion as measure through the slot (sidewall of 112).

As to claim 22, Silverbrook discloses that the method comprises forming a slot portion into the backside surface of the substrate (Fig.7, col.6, lines 56-60) and etching the substrate to

remove substrate material proximate the slot portion to form the fluid-handling slot (Fig.8-9, col.6, lines 60-64, col.7, lines 1-5).

As to claims 24-26, Silverbrook discloses to use multiple removal steps (Fig.6-9), including dry etching with a patterned hard mask (glass overcoat, col.6, lines 50-55).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hawkins et al (US 5,006,202) in view of Milligan et al (US 6,273,557).

Hawkins discloses a method formed by the method comprising:

forming a first pattern masking layer 34 sufficient to expose a desired area of a first surface (through vias 44A/44B) of a substrate 12 (Fig.18);

after forming the first patterned masking layer, forming a second patterned masking layer 47 (through vias 51, Fig.22-23) sufficient to expose less than the entirety of the desired area of the second surface;

forming a slot portion in the substrate through the second patterned masking layer (Fig. 23); and

removing additional substrate material to form a fluid-handling slot (Fig.24).

Further as to claim 1, Hawkins discloses to form fluid-handling passageways and ejection chambers 23, 28 over a first surface of the substrate (Fig.16). Hawkins fails to disclose the order cited, that of masking, forming and removing subsequent to forming the passageways and ejection chambers. However, since the same final product is formed, it is obvious to vary the order of the steps since there is no criticality given to the order. In general, the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

Milligan teaches to form passageways and firing chambers before masking and etching to form slots in a substrate (Fig.4A-6C). Therefore, it is still further obvious to vary the steps as cited because Milligan teaches that this is a useful technique for forming printheads.

As to amended claim 1, the embodiment of Fig.24 shows etching from both the backside and the frontside to form an etched structure for use as a channel plate (col.10, lines 18-20), which encompasses using with fluid-handling passageways and ejection chambers to form a print head die.

As to claim 2, Hawkins discloses a hard mask (thermal oxide, SiO₂).

As to claim 3, Hawkins discloses forming a photoresist layer 50 (Fig.22).

As to claim 4, Hawkins discloses etching the slot portion (col.10, lines 3-5).

As to claim 5, Hawkins discloses a through region positioned between two shallow regions (shelf 52, Fig.24).

As to claim 6, Hawkins discloses wet etching (col.10, lines 7-9).

As to claim 7, Hawkins discloses removing a portion of the second patterned masking layer (col.10, lines 3-7).

As to claim 9, Hawkins discloses that the method can be includes forming over second surface, as discussed above under claim 1.

As to claim 10, Hawkins discloses to form a subset since the etched area is smaller than the original exposed area.

As to claim 11, Hawkins discloses covering the entire first substrate surface with the hard mask (Fig.17) and subsequently removing hard mask material from the first area of the surface (Fig.18).

As to claims 13-19, see the rejection of claims 1-8 and 9-11. Fluid flows through the etched structure of Hawkins (the channel plate) to fluid-handling passageways and ejection chambers.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457) in view of Miller et al (US 2003/0141279 A1).

The discussion of Silverbrook from above is repeated here.

As to claim 23, Miller discloses sand drilling as mechanical cutting and multiple dry etching steps (paragraphs [0059], [0057]), and patterning a hard mask [0056]. It would have been obvious to use these techniques in the method of Silverbrook since Miller teaches that they are useful for forming inkjet printheads.

Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Silverbrook (US 6,019,457).

The discussion of Silverbrook from above is repeated here.

As to claim 27, Silverbrook does not disclose to use lift-off. Examiner takes official notice that lift-off is a conventional technique for forming patterned layers. It would have been obvious to one with ordinary skill in the art to use lift-off to pattern hard mask in the method of Silverbrook because it is a conventional and useful technique for forming masks.

As to claim 28, Silverbrook does not disclose to use wet etching, rather Silverbrook discloses to use isotropic etching. Isotropic etching may comprise wet etching, but it is not necessarily wet etching. However, Silverbrook teaches that plasma etching should be avoided in order to avoid damaging the heater 120 (col.7, lines 5-7, col.6, lines 34-67)

It would have been obvious to one with ordinary skill in the art to use wet etching as the isotropic etching method in the method of Silverbrook because wet isotropic etching is cheaper and saves money compared to plasma etching and because Silverbrook teaches to avoid plasma etching in order to avoid damaging the heater.

Claims 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al (US 2003/0141279 A1).

Miller discloses a printhead forming method comprising:

forming a fluid-handling slot in a substrate wherein a first portion of the sidewall is parallel (bottom surface of slot) to a first surface of the substrate, and a second portion of the sidewall is perpendicular to the first surface (sidewalls of slot, Fig.9d or 9f).

As to amended claim 21, Figures 9g and 9h show slots generally parallel to the thin-film surface (the plane coming in and out of the page) and portions of sidewalls at an obtuse angle (the curved part of the sidewall).

As to claims 23-26, Miller discloses sand drilling as mechanical cutting and multiple dry etching steps (paragraphs [0059], [0057]), and patterning a hard mask [0056].

Response to Amendment

The claims remain rejected over Hawkins '202, Silverbrook and Miller. The rejection over Hawkins (6,303,042) is withdrawn since there is no motivation to form passageways over a first surface and then etch the second surface, as in the context of claim 9.

Response to Arguments

Applicant's arguments filed 2/23/06 have been fully considered but they are not persuasive, to the extent that they still apply.

As to claim 21, applicant argues that Silverbrook does not define an obtuse angle. This is not persuasive since Fig.9 shows curved surfaces, which includes obtuse angles. The claims do not cite that the obtuse angle is defined according to portions extending along a single crystalline plane, extending to and touching the top, thin-film surface.

As to claim 1, applicant argues that Hawkins '202 does not have a slot formed by removing additional material in addition to the slot portion previously formed. In response, Hawkins discloses to remove additional material by etching, and the feature of a slot being previously formed is obvious as shown by Milligan.

As to claim 9, applicant argues that Hawkins '202 does not disclose slot sufficient to supply fluid from the second surface through the substrate to the first surface. In response, Hawkins discloses a channel plate, through which fluid flows. Fig.24 shows how fluid can flow through both surfaces, from top to bottom, or from bottom to top.

As to the argument that Hawkins '202 does not form a slot portion through less than an entirety, this argument is not understood because since the mask is masking the area, it is impossible to etch through more than the entirety. Only what is exposed is etched, and since less than an entirety is exposed, less than an entirety is etched.

Applicant argues that Miller fails to show a portion of a sidewall extending from a perpendicular-portion of the same sidewall to a thin-film surface of a substrate, where an obtuse angle is defined between the two portions. This argument is not commensurate in scope with the claims. The claims have open comprising language, and "extending" is a broad term.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko
Anita K Alanko
Primary Examiner
Art Unit 1765